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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/500,938	07/08/2004	Gary W. Elko	1053.001B	1487

22186 7590 02/07/2008
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EXAMINER

LEE, PING

ART UNIT	PAPER NUMBER
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2615

MAIL DATE	DELIVERY MODE
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02/07/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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Office Action Summary	Application No. 10/500,938	Applicant(s) ELKO ET AL.	
	Examiner Ping Lee	Art Unit 2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 April 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-78 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 12-25, 27-35, 42-56, 63-78 is/are rejected.
- 7) ☒ Claim(s) 6-11, 26, 36-41 and 57-62 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/ are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. An after final amendment was filed on 9/17/07 and was entered. As indicated in the interview summary mailed on 10/10/07, the final rejection mailed on 7/17/07 has been vacated. A new office action is provided below. Examiner would like to apologize for the delay.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-5, 12-19, 23-25, 76, 31-35, 42-46, 51-56, 63-66, 69 and 71 are rejected under 35 U.S.C. 102(b) as being anticipated by Elko (US006041127A).

Regarding claims 1, 3, 24, 31 and 32, Elko discloses a method for processing audio signals, comprising:

receiving a plurality of audio signals, each audio signal having been generated by different sensor of a microphone array (see Fig. 22); and

decomposing the plurality of audio signals into a plurality of eigenbeam outputs, wherein each eigenbeam output corresponds to a different eigenbeam for the microphone array and at least one of the eigenbeams has an order of two or greater (see Fig. 24; col. 17, lines 26-33).

Regarding claims 2, 12, 13, 33, 42, 43, 63 and 64, Elko shows the spherical harmonics based on a spherical configuration of the sensors in the microphone array. See the analysis from col. 12, line 15.

Regarding claims 4, 5, 34, 35 and 54-56, Elko shows the acoustically rigid sphere (col. 14, lines 15-16 and abstract).

Regarding claims 14, 44 and 65, the claimed discrete orthogonality condition reads on the condition as shown in Fig. 22 with discrete microphones, microphone 222 is being 90° from microphone 224.

Regarding claims 15 and 66, Elko shows treating each sensor signal as a directional beam for relatively high frequency components in the audio signal (col. 6, lines 32-38).

Regarding claims 16, 17, 76, 46, 51 and 71, the claimed auditory scene read on each steered direction formed by the microphone array. Elko shows that two or more different auditory scenes could be generated (col. 17, lines 18-20).

Regarding claims 18 and 52, Elko shows the weighting (see equation 31).

Regarding claims 19 and 45, Elko shows that DSP is being used for processing; therefore, it inherently stores and recovers data for subsequent processing.

Regarding claim 25, Elko shows the calibration (col. 17, lines 4-5).

Regarding claims 23 and 53, Elko shows the equalizer filter (2443).

Regarding claim 69, due to steering, Elko's system would discriminate noise and inherently maintain a minimum value of signal-to-noise ratio.

4. Claims 1, 12-24, 31, 42-46, 51-53, 67, 68 and 71 are rejected under 35 U.S.C. 102(b) as being anticipated by Moorer (US006072878A).

Regarding claims 1, 12-14, 24, 31 and 42-45, Moorer discloses a method for processing audio signals, comprising:

receiving a plurality of audio signals, each audio signal having been generated by a different sensor of a microphone array (for generating mono sources 17 and 19); and

decomposing the plurality of audio signals into a plurality of eigenbeam outputs (the end of col. 5), wherein each eigenbeam output corresponds to a different eigenbeam for the microphone array and at least one of the eigenbeams has an order of two or greater.

Regarding claim 15, Moorer shows the step of treating each sensor signal as a direction beam (col. 7, lines 60-65).

Regarding claims 16-18, 46, 51, 52 and 71, the claimed auditory scene reads on the audio signal reproduced by a speaker.

Regarding claims 19-22, 67 and 68, with the digital signal processing (col. 10, lines 17-27), the data is inherently stored for subsequent processing, or it reads on the recording medium.

Regarding claims 23 and 53, Moorer shows the equalizer filter (col. 6, lines 19-42).

Claim Rejections - 35 USC § 103

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
6. Claims 27-30, 47-50, 70 and 72-75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Elko.

Regarding claims 27, 28, 47, 48, 72 and 73, Elko fails to explicitly show that each array is adapted for audio signals in a different frequency range. Elko shows in Fig. 22 that the sensors are arranged in two or more concentric arrays of sensors. Elko teaches that each pair of microphones (e.g. 224 and the one that is 180° from it) is steered to an audio source. With audio sources in different frequency range and each pair of microphones steering to different source, Elko's system is capable of adapted for audio signals in a different frequency range.

Regarding claims 29, 30, 49, 50, 74 and 75, using the same teaching that each pair of microphone steering to different source, with one source having both low and high frequency signals and the rest of the sources having low frequency signal, Elko's system is capable of processing relatively low-frequency signal using all sensors and only a subset of sensors is used to process relatively high frequency signal.

Thus, it would have been obvious to one of ordinary skill in the art to modify Elko by selectively steering the microphone in order to capture the sound in different frequency.

Regarding claim 70, Elko fails to show that the SNR is characterized using white noise gain. However, it would have been obvious to one of ordinary skill to determine the SNR based on white noise gain.

7. Claims 20-22, 67, 68 and 76-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Elko in view of Metcalf (US006239348B1).

Regarding claims 20-22, 67, 68 and 76-78, Elko teaches how to generate an output beam based on the directed angle, but fails to explicitly show how to recover the data and transmitting the data to remote receipt and processing. Based on Elko's teaching, one skilled in the art would have expected that the generated output beam could be utilized for further processing. Metcalf teaches how to use stored sound field model to create an auditory scene. Thus, it would have been obvious to one of ordinary skill in the art to modify Elko in view of Metcalf by utilizing the stored eigenbeam outputs to create an auditory scene in order to recreate a sound event.

8. Claims 3 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moorer.

Regarding claims 3 and 32, Moorer fails to explicitly show an order of at least three. However, Moorer clearly teaches that the order n is related to the number of speaker signals to be recorded/reproduced (col. 4, lines 13-18). The example provided in Fig. 1, 3 or 4 in Moorer is five speakers, so order of two is sufficient. If a sound system having more than five speakers, it would have been obvious to one of ordinary skill in the art to modify Moorer's matrix to have the order of at least three in order to accurately represent the sound.

9. Claims 2, 4, 5, 25, 33-35, 44, 54-56 and 63-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moorer in view of Elko (US 6,041,127).

Regarding claims 2, 4, 5, 33-35, 44, 54-56 and 63-65, Moorer fails to show that the microphones are mounted on an acoustically rigid sphere. Moorer teaches a general microphone array and the corresponding processor using spherical harmonics derived from the microphone signal without specifying the structure. Elko teaches mounting the microphones on a rigid sphere (col. 1, line 65) to provide harmonic analysis. Thus, it would have been obvious to one of ordinary skill in the art to modify Moorer by mounting the microphones as suggested in Elko in order to improve surround sound recording and playback.

Regarding claim 25, Moorer fails to show calibrating the microphones. Moorer teaches using a general microphone array to derive the speaker signals based on the difference between microphones. Elko suggests calibrating the microphones among each other to improve the accuracy (col. 17, lines 1-25). Thus, it would have been obvious to one of ordinary skill in the art to modify Moorer by calibrating the microphones in the array in order to improve the response.

10. Claims 10, 11, 40, 41, 61 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moorer in view of Elko as applied to claims 1, 2 and 4 above, and further in view of Staple et al (US005288955A).

Regarding claims 10, 11, 40, 41, 61 and 62, Moorer fails to show the soft sphere. Elko shows the rigid sphere. Staple et al (hereafter Staple) teaches that the microphones are mounted on a soft sphere in order to reduce the vibration and noise.

Thus, it would have been obvious to one of ordinary skill in the art to modify Moorer and Elko by mounting the microphones on a soft sphere in order to reduce the noise and vibration.

Allowable Subject Matter

11. Claims 6-9, 36-39 57-60, 26-30, 47-50 and 72-75 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

12. Applicant's arguments filed 9/17/07 have been fully considered but they are not persuasive.

On p. 13, applicant argued that Moorer fails to disclose the step of decomposing a plurality of audio signals into a plurality of eigenbeam outputs because the plurality of audio signals are not audio signal generated by a microphone array. As shown in Fig. 3, there are two monaural sources 17 and 19. As disclosed on col. 3, lines 43-45, each monaural source signal is being picked up by at least one microphone. Therefore, the two monaural sources signals are generated by at least two microphones, which read on the claimed microphone array. As shown in Fig. 5, for example, the microphone arrays generate three signals which are decomposed to form a plurality of eigenbeam outputs. As disclosed on col. 7, lines 12-21, Moorer discloses that second spatial

harmonics or more could be generated. As shown in Fig. 4 in view of Fig. 5, each microphone is responsible to generate an eigenbeam output, and each eigenbeam output being different from other eigenbeam output. Applicant's argument based on Fig. 7 is not convincing. One has to read Moorer as a whole. Moorer discloses that the second or more spatial harmonics could be generated and this disclosure is not limited to any specific embodiments as illustrated in Figs. 3, 7 or 8.

On p. 13, applicant states that Moorer '152 does not disclose the eigenbeam have an order of two or more. Moorer '152 is a CIP of Moorer '878, so it includes all the disclosure of eigenbeam having an order of two or more. To simplify the prosecution, Examiner did not include the rejection in view of Moorer '152 because it would duplicate the 102 rejection in view of Moorer '878. However, Examiner reserves the right to use Moorer '152 whenever the situation is appropriate.

On p. 15, applicant argued that Moorer fails to show the microphone arrangement satisfy orthogonality condition. However, applicant's argument is based on the disclosure in the specification. Those definitions are not clearly and explicitly stated in the claims. Therefore, the argument is not convincing.

On p. 17, applicant argued that Moorer fails to show the limitation of claims 15 and 66. As disclosed in Moorer, the gain defines the angle, therefore, define the direction. The claimed relatively high frequency components in the audio signals reads on any audio signal picked up by the microphones that has above zero frequency.

On p. 17, applicant argued that scalar weights in Moorer cannot be read as the equalizer filter as claimed in claims 23 and 53. This is not convincing. By definition, a

filter is a circuit that eliminates certain portions of a signal. An equalizer is a device that equalizes. So the scalar weights can read on the claimed limitation.

From p. 17-18, applicant argued that Moorer '878 only shows eigenbeam having 0th and 1st orders. This is not true. Moorer '878 explicitly disclose the harmonics with second order or higher on col. 7, lines 12-19. Since Moorer '152 is a CIP of Moorer '878, this disclosure is also in Moorer '152.

Allowable Subject Matter

13. Claims 6-11, 26, 36-41 and 57-62 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

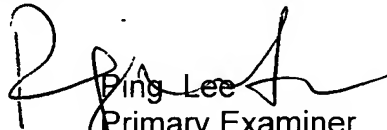
14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ping Lee whose telephone number is 571-272-7522.

The examiner can normally be reached on Monday, Wednesday and Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian C. Chin can be reached on 571-272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2615

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


Ping Lee
Primary Examiner
Art Unit 2615

pwl